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The survey of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, and dioxin-like polychlorinated biphenyls levels in pasteurized cow's milk collected in Qazvin

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ABSTRACT

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDFs), collectively termed dioxins, as well as polychlorinated biphenyls (PCBs) are widespread environmental contaminants. A local survey was carried out on seven samples of pasteurized full-fat grade milk commercially available in Qazvin in 2013 to assess the concentrations of PCDD/PCDFs and dioxin-like PCBs (DL-PCBs) in pasteurized cow's milk. The mean concentration of PCDD/PCDFs for pasteurized samples determined 0.74 pg toxic equivalent [TEQ]/g fat (range 0.34-1.10). In this survey observed in all samples of pasteurized milk the mean of total TEQ concentration was 0.880 pg TEQ/g fat that lower than the thresholds defined by the European Union regulations for the sum of PCDD/PCDFs and DL-PCBs ($P < 0.05$). This difference could be possible because of the industrial condition in Qazvin. As a result of the importance of the issue, it is suggested that planning must carry out to control and prevent these types of compounds into the food chain.

1. Intoduction

Dioxins are a class of structurally and chemically related polyhalogenated aromatic hydrocarbons that mainly includes polychlorinated dibenzo-p-dioxins (PCDDs or dioxins), dibenzofurans (PCDFs or furans) and the "dioxin-like" polychlorinated biphenyls (DL-PCBs). They constitute a group of persistent environmental chemicals and usually occur as a mixture of congeners (1). The largest release of these chemicals today is from open burning of household waste, municipal waste, medical waste, landfill fires, and agricultural and forest fires. Dioxins can be generated and released to the environment from following incineration processes. Dioxin may be absorbed into the body by three main routes of intake dermal absorption, ingestion, and inhalation. Dioxins compounds are environmentally and biologically stable and, as a result, human exposure is chronic and widespread. From the atmosphere, these particles are deposited and accumulate in the leafy vegetation (such as grass) and in the soil, which acts as a natural sink. DL-PCB concentrations in soil are directly related with the environmental pollution. PCBs presence in soil and vegetation makes these pollutants available to be eaten by animals during grazing, and these contaminants are rapidly absorbed from the gastrointestinal tract. PCBs once absorbed by animals, accumulate in the fat tissue due to their lipophilic nature and during lactation periods they are secreted in milk (2-4).

Dioxins induce a broad spectrum of biological responses, including induction of gene expression for cytochrome P450, CYP1A1, and CYP1A2, disruption of normal hormone signaling pathways, reproductive and developmental defects. Briefly, it indicates that the inappropriate modulation of gene expression represents the initial steps in a series of biochemical, cellular, and tissue changes that result in the toxicity observed.

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